

## CLAIMS

1. A method of enhancing a signal quality from a first atom of a pair of spin-spin coupled atoms, in a magnetic resonance imaging system, such method comprising the steps of:

exciting the first atom of the pair of spin-spin coupled atoms within the magnetic resonance imaging system at a Larmor frequency of the first atom;

exciting the second atom at the Larmor frequency of the second atom; and

detecting a signal from the first atom.

2. The method as in claim 1 further comprising sequentially exciting the first and second atoms.

3. The method as in claim 2 further comprising exciting the first atom before the second atom.

4. The method as in claim 1 further comprising simultaneously exciting the first and second atoms.

5. The method as in claim 1 further comprising detecting a signal from the second atom.

6. The method as in claim 1 wherein the step of detecting a signal from the first atom further comprises measuring a free induction decay following excitation of the first and second atoms.

7. The method as in claim 6 further comprising measuring the free induction decay using projection reconstruction of hard pulses.

8. The method as in claim 6 wherein the step of measuring the free induction decay further comprises determining a three-dimensional location of the measurement of free induction decay.

9. The method as in claim 8 wherein the step of determining a three-dimensional location of the measurement of free induction decay further comprises combining a plurality of such measurements to produce an image.

10. The method as in claim 1 further comprising repeating the step of exciting the first atom of the pair of spin-spin coupled atoms within the magnetic resonance imaging system at a Larmor frequency of the first atom.

11. The method as in claim 10 further comprising detecting a signal from the first atom without exciting the second atom.

12. The method as in claim 11 wherein the step of detecting the signal from the first atom without exciting the second atom further comprises measuring a free induction decay of the first atom without exciting the second atom.

13. The method as in claim 12 further comprising comparing a Fourier transform of the measured free induction decay following excitation of the first and second atoms with the measured free induction decay of the first atom without exciting the second atom to provide a Fourier transformed difference value.

14. The method as in claim 13 further comprising defining the Fourier transformed difference value as a measure of pH.

15. A method of enhancing a signal quality from a first atom of a pair of spin-spin coupled atoms, in a magnetic resonance imaging system, such method comprising the steps of:

exciting the first atom of the pair of spin-spin coupled atoms within the magnetic resonance imaging system at a Larmor frequency of the first atom;

decoupling the second atom from the first atom; and

detecting a signal from the first atom.

16. The method as in claim 15 wherein the step of decoupling the second atom from the first atom further comprises the step of exciting the second atom at a Larmor frequency of the second atom

17. The method as in claim 15 further comprising sequentially exciting the first and second atoms.

18. The method as in claim 17 further comprising exciting the first atom before the second atom.

19. The method as in claim 15 further comprising simultaneously exciting the first and second atoms.

20. The method as in claim 15 further comprising detecting a signal from the second atom.

21. The method as in claim 15 wherein the step of detecting a signal from the first atom further comprises measuring a free induction decay following excitation of the first and second atoms using projection reconstruction of hard pulses.

22. The method as in claim 21 wherein the step of measuring the free induction decay further comprises determining a three-dimensional location of the measurement of free induction decay.

23. The method as in claim 22 wherein the step of determining a three-dimensional location of the measurement of free induction decay further comprises combining a plurality of such measurements to produce an image.

24. The method as in claim 15 further comprising repeating the step of exciting the first atom of the pair of spin-spin coupled atoms within the magnetic resonance imaging system at a Larmor frequency of the first atom.

25. The method as in claim 24 further comprising detecting a signal from the first atom without exciting the second atom.

26. The method as in claim 25 wherein the step of detecting the signal from the first atom without exciting the second atom further comprises measuring a free induction decay of the first atom without exciting the second atom.

27. The method as in claim 26 further comprising comparing a Fourier transform of the measured free induction decay following excitation of the first and second atoms with the measured free induction decay of the first atom without exciting the second atom to provide a Fourier transformed difference value.

28. The method as in claim 27 further comprising defining the Fourier transformed difference value as a measure of pH.